UNPUBLISHED PRELIMINARY DATA

2p.

PROGRESS REPORT No. 2

NASA ORDER No. R-75[redacted]

[redacted]

ENERGY DISSIPATION CHARACTERISTICS IN TISSUE FOR IONIZING RADIATION IN SPACE

Submitted to NASA, Washington, D. C.

By

H. J. Schaefer.
Hermann J. Schaefer
Principal Investigator

GPO PRICE $ ______

OTS PRICE(S) $ ______

Hard copy (HC) 1.00

Microfiche (MF) .50

FACILITY FORM 602

N65 16484	
(ACCESSION NUMBER)	(THRU)
2	1
(PAGES)	(CODE)
CR 50,471	04
(NASA CR OR TMX OR AD NUMBER)	(CATEGORY)

[redacted]

Period Covered

1 March 1963 - 31 May 1963

6280002

U.S. NAVAL SCHOOL OF AVIATION MEDICINE, Pensacola
U.S. NAVAL AVIATION MEDICAL CENTER
PENSACOLA, FLORIDA

NASA CR-50,471

Evaluation of emulsion packs flown by this investigator on the MA-8 Mission (Schirra) showed a pronounced directional effect of low and medium energy protons which were picked up when the vehicle passed, on three of its six orbits, through the Capetown Anomaly. This finding prompted a discussion as to what extent the local hardware in the capsule would be responsible for the directionality of the radiation field inside. In this connection, it seemed of interest to investigate, theoretically and in general terms quite aside from the particular system of MA-8, the quantitative aspects of how, for typical proton energy spectra, the shield geometry of the vehicle would affect the radiation field within.

Such an analysis also promises to furnish data which could be helpful toward finding the best method of determining the true radiation exposure in flight through solar particle beams or through the Van Allen Belt. Against presently prevailing opinion, the study tries to argue the point for measuring, on a manned deep space mission, not only the actual exposure of the astronaut with radiation sensors carried on the person, but also the "air" dose distribution in the ship with stationary sensors. Readings of "air" dose if shown summarily in a display on the instrument panel would convey information on the directionality of the radiation with helpful clues for adjusting body position for minimum exposure.

A greatly simplified model of a Gemini capsule, consisting of a conical part of low thickness with a spherical heat shield of large thickness as base, has been assumed, and the radiation field inside has been analyzed for three basic types of proton spectra. The distribution of the "air" dose inside the ship as well as the dosage field within a spherical target assumed at different locations inside the ship has been determined. The results show that even for the greatly simplified model a highly structured dose distribution prevails inside due to different shield thicknesses offered to the incoming radiation for different directions. Furthermore, the dose distribution within a compact target (human body) within the ship strongly depends on location and orientation. The magnitude of local air dose at a given location does not allow direct inferences on the dosage distribution that would develop in a compact target at that location. For instance, the dose to the lenses of the eyes changes only slightly with directional orientation of the head in the nose tip, but changes by a factor of two close to the heat shield.

Quantitatively, the effects are found to depend on the steepness of the energy spectrum. They are more pronounced for the steeper spectrum such as the ones reported for flare-produced protons, but they are still quite significant even for the smallest spectral slope reported for Van Allen Belt protons. The effects are completely reversed for the spectrum of the ordinary cosmic ray beam due to the build-up phenomenon. This might allow some inferences on the radiation field resulting from the rare type of so-called relativistic flares.

A Joint Report on the foregoing analysis is completed and being printed. It will be submitted for approval as soon as it comes off the press (expected date June 28).

[redacted]